

INTERNATIONAL SEARCH REPORT

International Application No
PCT/DE2004/001854

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01L33/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 324 399 A (TOSHIBA KK) 2 July 2003 (2003-07-02) paragraphs '0009! - '0120!	1-13
X	WO 01/41225 A (CREE LIGHTING COMPANY) 7 June 2001 (2001-06-07) page 17, paragraph 2 - page 18, paragraph 2	1-13
X	EP 1 271 665 A (TOSHIBA KK) 2 January 2003 (2003-01-02) paragraphs '0046! - '0071!	1-13
X	EP 1 329 961 A (TOSHIBA KK) 23 July 2003 (2003-07-23) paragraphs '0068! - '0071!	1-13

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family.

Date of the actual completion of the international search

8 April 2005

Date of mailing of the International search report

14/04/2005

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel: (+31-70) 340-2040, Tx: 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

van der Linden, J.E.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/DE2004/001854

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
EP 1324399	A	02-07-2003	CN EP JP TW US	1430290 A 1324399 A2 2003258296 A 576864 B 2003173568 A1		16-07-2003 02-07-2003 12-09-2003 21-02-2004 18-09-2003
WO 0141225	A	07-06-2001	AU AU CA CA CN CN EP EP JP JP TW TW WO WO US US	1790501 A 4139101 A 2393007 A1 2393081 A1 1402880 A 1423842 A 1234334 A1 1234344 A2 2004505434 T 2004511080 T 465130 B 535300 B 0141219 A1 0141225 A2 2004041164 A1 6410942 B1 6657236 B1		12-06-2001 12-06-2001 07-06-2001 07-06-2001 12-03-2003 11-06-2003 28-08-2002 28-08-2002 19-02-2004 08-04-2004 21-11-2001 01-06-2003 07-06-2001 07-06-2001 04-03-2004 25-06-2002 02-12-2003
EP 1271665	A	02-01-2003	CN EP JP US	1395321 A 1271665 A2 2003174191 A 2002195609 A1		05-02-2003 02-01-2003 20-06-2003 26-12-2002
EP 1329961	A	23-07-2003	JP CN EP TW US	2003218383 A 1433088 A 1329961 A2 575984 B 2003178626 A1		31-07-2003 30-07-2003 23-07-2003 11-02-2004 25-09-2003

INTERNATIONALE RECHERCHENBERICHT

Internationales Aktenzeichen

PCT/DE2004/001854

A. KLASSEIFIZIERUNG DES ANMELDUNGSGEGENSTANDES
IPK 7 H01L33/00

Nach der Internationalen Patentklassifikation (IPK) oder nach der nationalen Klassifikation und der IPK

B. RECHERCHERIEDE GEBIETE

Recherchiertes Mindestprüfstoß (Klassifikationssystem und Klassifikationssymbole)

IPK 7 H01L

Recherchierte aber nicht zum Mindestprüfstoß gehörende Veröffentlichungen, soweit diese unter die recherchierten Gebiete fallen

Während der internationalen Recherche konsultierte elektronische Datenbank (Name der Datenbank und evtl. verwendete Suchbegriffe)

EPO-Internal, PAJ

C. ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie*	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
X	EP 1 324 399 A (TOSHIBA KK) 2. Juli 2003 (2003-07-02) Absätze '0009! - '0120!	1-13
X	WO 01/41225 A (CREE LIGHTING COMPANY) 7. Juni 2001 (2001-06-07) Seite 17, Absatz 2 - Seite 18, Absatz 2	1-13
X	EP 1 271 665 A (TOSHIBA KK) 2. Januar 2003 (2003-01-02) Absätze '0046! - '0071!	1-13
X	EP 1 329 961 A (TOSHIBA KK) 23. Juli 2003 (2003-07-23) Absätze '0068! - '0071!	1-13

 Weitere Veröffentlichungen sind der Fortsetzung von Feld C zu entnehmen Siehe Anhang Patentfamilie* Besondere Kategorien von angegebenen Veröffentlichungen:
"A" Veröffentlichung, die den allgemeinen Stand der Technik definiert, aber nicht als besonders bedeutsam anzusehen ist

"E" älteres Dokument, das jedoch erst am oder nach dem Internationalen Anmeldedatum veröffentlicht worden ist

"L" Veröffentlichung, die geeignet ist, einen Prioritätsanspruch zweckmäßig erscheinen zu lassen, oder durch die das Veröffentlichungsdatum einer anderen im Recherchenbericht genannten Veröffentlichung belegt werden soll oder die aus einem anderen besonderen Grund angegeben ist (wie ausgeführt)

"O" Veröffentlichung, die sich auf eine mündliche Offenbarung,

eine Benutzung, eine Ausstellung oder andere Maßnahmen bezieht.

"P" Veröffentlichung, die vor dem Internationalen Anmeldedatum, aber nach dem beanspruchten Prioritätsdatum veröffentlicht worden ist

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"X" Veröffentlichung von besonderer Bedeutung; die beanspruchte Erfindung kann allein aufgrund dieser Veröffentlichung nicht als neu oder auf erfinderischer Tätigkeit beruhend betrachtet werden

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"S" Veröffentlichung, die Mitglied derselben Patentfamilie ist

Datum des Abschlusses der internationalen Recherche

Absendedatum des Internationalen Recherchenberichts

8. April 2005

14/04/2005

Name und Postanschrift der Internationalen Recherchenbehörde
Europäisches Patentamt, P.B. 5818 Patentzaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Bevollmächtigter Bediensteter

van der Linden, J.E.

INTERNATIONALER RECHERCHENBERICHT

Angaben zu Veröffentlichungen, die zur selben Patentfamilie gehören

Internationales Aktenzeichen

PCT/DE2004/001854

Im Recherchenbericht angeführtes Patentdokument		Datum der Veröffentlichung		Mitglied(er) der Patentfamilie		Datum der Veröffentlichung
EP 1324399	A	02-07-2003	CN	1430290 A		16-07-2003
			EP	1324399 A2		02-07-2003
			JP	2003258296 A		12-09-2003
			TW	576864 B		21-02-2004
			US	2003173568 A1		18-09-2003
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			AU	4139101 A		12-06-2001
			CA	2393007 A1		07-06-2001
			CA	2393081 A1		07-06-2001
			CN	1402880 A		12-03-2003
			CN	1423842 A		11-06-2003
			EP	1234334 A1		28-08-2002
			EP	1234344 A2		28-08-2002
			JP	2004505434 T		19-02-2004
			JP	2004511080 T		08-04-2004
			TW	465130 B		21-11-2001
			TW	535300 B		01-06-2003
			WO	0141219 A1		07-06-2001
			WO	0141225 A2		07-06-2001
			US	2004041164 A1		04-03-2004
			US	6410942 B1		25-06-2002
			US	6657236 B1		02-12-2003
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			EP	1271665 A2		02-01-2003
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			US	2002195609 A1		26-12-2002
EP 1329961	A	23-07-2003	JP	2003218383 A		31-07-2003
			CN	1433088 A		30-07-2003
			EP	1329961 A2		23-07-2003
			TW	575984 B		11-02-2004
			US	2003178626 A1		25-09-2003

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

		Date of mailing (day/month/year)
Applicant's or agent's file reference P2003, 0565WO		FOR FURTHER ACTION See paragraph 2 below
International application No. PCT/DE2004/001854	International filing date (day/month/year) 19.08.2004	Priority date (day/month/year) 29.08.2003
International Patent Classification (IPC) or both national classification and IPC		
Applicant OSRAM OPTO SEMICONDUCTORS GMBH		

1. This opinion contains indications relating to the following items:

- Box No. I. Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/EP	Authorized officer
Facsimile No.	Telephone No.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/DE2004/001854

Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

This opinion has been established on the basis of a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of international search (under Rule 12.3 and 23.1(b)).

2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a. type of material

- a sequence listing
 table(s) related to the sequence listing.

b. format of material

- in written format
 in computer readable form

c. time of filing/furnishing

- contained in the international application as filed.
 filed together with the international application in computer readable form.
 furnished subsequently to this Authority for the purposes of search.

3. In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No. PCT/DE2004/001854

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims <u>1-13</u>	YES
	Claims _____	NO
Inventive step (IS)	Claims _____	YES
	Claims <u>1-13</u>	NO
Industrial applicability (IA)	Claims <u>1-13</u>	YES
	Claims _____	NO

2. Citations and explanations:

1 Reference is made to the following documents:

D1: EP 1 324 399 A (TOSHIBA KK) 2 July 2003

D2: WO 01/41225 A (CREE LIGHTING COMPANY) 7 June
2001

2

The present application does not meet the requirements of PCT Article 6 because the subject matters of the claims are not clear. Said lack of clarity also affects the assessment of novelty and/or inventive step pursuant to PCT Article 33(2) and (3).

The phrase "thin-layer light-emitting diode chip" does not have a generally recognized meaning and leaves the reader uncertain as to the meaning of the technical feature in question. As a result, the subject matter of said claim is not clearly defined.

3

Notwithstanding the abovementioned lack of clarity, the application does not, moreover, meet the requirements of PCT Article 33(1) because the subject matter of independent claims 1, 7 does not involve an inventive

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PCT/DE2004/001854

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

step within the meaning of PCT Article 33(3).

D1 is regarded as closest prior art with respect to the subject matter of claims 1, 7. It discloses (paragraphs 9-120) a light-emitting diode chip comprising an epitaxial layer sequence (14, 15) which has an active zone (12) generating an electromagnetic radiation, and wherein the radiation decoupling surface of the epitaxial layer sequence that faces away from the carrier element (10) has a patterning (18) comprising mutually adjacent projections which taper in the direction away from the radiation decoupling surface and have a lateral grid dimension which is smaller than a wavelength of an electromagnetic radiation emitted from the epitaxial layer sequence.

Therefore, the subject matter of claims 1, 7 differs from D1 by virtue of the fact that the light-emitting diode chip has a reflective layer arranged on a main surface of the epitaxial layer sequence that faces the carrier element, and the patterning is introduced into a layer which contains glass material and is arranged on the radiation decoupling surface of the epitaxial layer sequence.

The problem addressed by the present invention can therefore be considered that of avoiding the surface patterning of the semiconductor chip (by means of an etching method).

However, these features have already been used for the same purpose in a similar light-emitting diode chip, cf. D2 (exemplary embodiment 7). If a person skilled in the art wished to achieve the same aim in a light-emitting diode chip as per D1 (or the document by I. Schnizter mentioned in the application), he could easily apply

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INTERNATIONAL SEARCHING AUTHORITY

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PCT/DE2004/001854

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

these features to like effect to the subject matter of D1. In this way he would arrive at a light-emitting diode chip as per claims 1, 7 without thereby being inventive.

4

Claims 2-6, 8-13 do not contain any features which, in combination with the features of any claim to which they refer, meet the PCT requirements for novelty and inventive step.